

(19) **Federal Republic
of Germany**

**German
Patent Office**

(12) **Laid Open Document**

(10) **DE 199 21 748 A1**

(21) File number: 199 21 748.3
(22) Date of application 11. 5. 1999
(43) Date of laying open 23. 11. 2000

(51) Int Cl.⁷
G 07 C 11/00
G 06 F 17/60
G 07G 1/12

(71) Applicant:
Kuegel, Stefan, 94034 Passau, DE

(72) Inventor

same as the applicant

The following information is taken from the documents submitted by the applicant.
The search request according to section 43 paragraph 1 of the Patent Law has been placed.
Examination request according to section 44 of the Patent Law has been placed.

(54) System and method for controlling automated and staff-less logistics, lending and sales systems

(57) The invention relates to a system and method for controlling and monitoring automated, staff-less logistics systems, just as automated, staff-less lending and sales systems with which the articles should be detected electronically fast and simply. The main objectives of the invention are documenting, controlling and monitoring the material and goods flow while at the same time doing without the previously necessary personnel for retail, lending and selling by using electronic identification elements like transponders. Possible applications are controlling, detecting and monitoring article inventory and movements in supply chain, in retail, in libraries, in plants, in homes, in staff-less lending and sales apparatus, just as in the management of "intelligent homes".

Description

The invention relates to a system and method for controlling and monitoring automated, staff-less logistics systems, just as automated, staff-less lending and sales systems with which the articles should be detected electronically fast and simply. The main objectives of the invention are documenting, controlling and monitoring the material and goods flow while at the same time doing without the previously necessary personnel for retail, lending and selling by using electronic identification elements like transponders. Possible applications are controlling, detecting and monitoring article inventory and movements in supply chain, in retail, in libraries, in plants, in homes, in staff-less lending and sales apparatus, just as in the management of "intelligent homes".

Essential elements of the system are tags, readers, check-in/check-out zones and an electronic control system (computer), furthermore, peripheral equipment is such as card readers, automatic doors, labeling equipment:

- tags are identification elements, consisting of a carrier, for example, a label, and a chip, for example a small-dimensioned RFID-transponder chip which can be applied to a common (price) tag, due to cost conceivable in READ ONLY version (for example 64-bit read-only transponder).
- Readers are reading equipment that identify marked articles in a space with tags and are attached in an area of the article display or in a warehouse on shelves, (tubular) lamps, palettes, transportation media or attached check-in or check-out zones, for example when goods enter or exit, can be attached in entrance and exit areas – separated by automatic doors.
- Check-in/check-out zones are controlled-accessibility, closable entrance and exit areas with reading equipment for detecting the articles at the entrance or exit, with card readers for payment of the goods by the customers, with receipt printers and displays, just as with automatic door systems where one and the same space can serve as check-in and check-out zones, that means at least one single check-in and check-out zone insures the operation of a staff-less, self-service store.
- Computer system for the logistical control of the external peripheral equipment like readers, tag-dispenser, label printer, automatic doors, card reader, access controls, security and anti-theft systems etc., is also a control system for managing and processing the information with information from the transponder chips, for example, for inventory management, automatic ordering management, complaint function, permanent stock determination, electronic data interchange etc.

Tags are known in the art as electronic identification elements, consisting of a RFID-transponder chip that can be detected from a distance (for example described in DE 197 20 747 A1, WO 87/04900, EP 0 573 469) and of a carrier, for example, a common self-adhering (price) label with, if necessary, various visible details, logos, advertising, barcodes or information of the marked article, for example, details about the goods, like the selling price, net/gross price per selling unit, return-deposit price, information concerning the weight on the surface of the label. According to patent claim 7 of the present invention a label should fulfill two functions: 1. Information from customers and commissioners of a warehouse with article information, 2. Individual authentication of the marked article. Here the label has a certain electrically conducting material or the label itself consists partially or completely of this material which functions as an antennae or resonant circuit of the transponder.

Carrier articles (5) marked with transponders can be permanently identified through communication with reading devices (1), named "reader" in the following. The articles marked and exposed in any type of space (2) are scanned by reading devices and their entrance or exit is detected, the inventory change is registered and placed in the account. With this concept of the material flow control, a system was developed for the operation of a staff-less service, retail and logistics apparatus, said system already exists by using barcode reading devices at recording tables (DE 197 34 152 A1) and which requires the users, with the help of barcode scanners, to detect the articles by themselves, before they can leave the sales room after paying for the goods. It is, however, more expedient to guarantee the use of apparatus that are operated without staff via automatic recordable identification elements, without necessitating users or customers to use the detection measures, and to simultaneously take care of the guaranteed security of the electronic article surveillance, where the movements of the marked articles in the room should also be recorded and prevent losses. As a solution, the invention provides that transponders are used as the identification elements, said elements make an automated control and surveillance process and a system possible that not only is suited for avoiding store theft, but also is suited for documentation, control and surveillance of the material and goods flow without needing the staff that was previously necessary in retail, lending and sales. Through this the intensive activities, such as the detection and monitoring of the delivery of goods or the sales of goods at the cash register, become superfluous to the benefit of increased services and customer service, just as also the decrease in waiting times at recording cash registers.

Tags are permanently scanned according to patent claim 2 not only in a check-in/check-out area

(3) (entrance, and respectively, exit zones), but also within an area of the article display or in a warehouse (2), for example in a supermarket or in a library, where the system can seamlessly register the inventory of all of the articles.

In the case of deviations from the inventory, that means with the loss of a tag from the reading range of a reader, for example through destruction or shielding of the tag, the system automatically records the absent return signal from the transponder and it can initiate a certain action (alarm signal).

Transponder chips can be changed in a manner through manipulation, for example, as soon as the label is removed from the carrier article, such that the manipulated tag is identified by the system, as a consequence of this the system records the change and if necessary a certain action is activated. The solution recommended in DE 197 20 747 A1 describes a first variation of the invention for which the carrier has at least a rated break range, where this breaks the electrical connection between the circuit and coil and is permanently interrupted and the connection is signified in that the external reading device recognizes the incapacity of the transponder to function in the event of a break of the electrical connection between circuit and coil, just as a second variation in which the carrier has at least a rated weakening range, where with this weakening the resonant circuit, which is created by the circuit and coil, is detuned in such a manner that this can be detected with the external reading device and this is recognized in that for a manipulation process the security element is burdened to the effect that in the rated weakening range a distortion occurs, possibly even a break.

The solution described in patent claims 7 to 9 provide that a self-adhering tag (label) can be removed with the transponder chip, that is also bonded to the underside of the tag, from the carrier article, however here in a possible case the transponder that is still active remains on the surface of the carrier article, whose IC-circuit can also still be identified without an antenna, in case the signal strength between transponder and reader suffices for communication and that in every other case this type of manipulation causes the irreparable change in the chip, caused by at a minimum at least one rated break position in the resonant circuit of the transponder chip, said rated break position is separated when the tag (label) is peeled off, possibly also by removing the label that functions as antenna or resonant circuit, where then a reader records the change.

Also a willful misappropriation of a marked article from the reading range of a reader, for example, by shielding the tag, causes the identification of the manipulated article, because the system records the change in the inventory as a consequence of the loss of a tag from the reader's reading range and a pre-determined action is set into action.

The material or goods flow can be virtually tracked with the movement of the articles (5) marked with tags in the reading areas of various readers (1) which scan the tags in a room (2/3), covering the whole area. The movement information of the tags gives information concerning the path of every customer with marked articles and delivers, for example, in-store sales related information for market research (data warehouse, virtual real-time customer studies).

The information of the incoming and outgoing goods streams, which can be documented with tags, can also be transferred electronically, for example, via Electronic Data Interchange (EDI/EDIFACT), through which the incoming and outgoing control of the goods automatically takes place through the comparison of the information and the scanned deliveries of goods at the place of origin, and correspondingly, detection place in check-in/check-out zones. In DE 196 24 513 C1 a method is described for goods and/or manufacturing accompanying documentation, control and monitoring, said method information from the data storage components is inputted into spreadsheets and this information is transferred to a central computer or to a computer network for the purpose of overseeing the surveillance, manufacturing control or warehousing.

The marked articles can be completely monitored and controlled, according to patent claim 5, in a continuous supply chain from producer through the distributors and sales set-ups to the household of the end-user, which makes possible the automated and staff-less operation of the logistics and sales of goods, just as the household management in an "intelligent house". For this, the identification information of the articles to be delivered, for example, continuous or individually fixed article numbers are collected in data files or individually automatically sent from one place to another and these are compared with the identification information in check-in/check-out zones. The system records a possible incongruency in the information and signals deficiencies and correspondingly incorrect deliveries of articles and causes a pre-determined action to take place, for example, an automatic complaint for the suppliers.

In connection with internet compatible software the material flow control, here especially logistics and sales of goods, can be operated on-line as also stationary, for example, a "storefront" software makes possible the control of external and internal computers for the internet sales and simultaneously the control of external and internal computers for the stationary sales in decentralized, staff-less branch stores, where one can access a common inventory of a central server with an information bank.

Reading devices for transponder chips (reader) are both securely installed equipment as also mobile hand-held devices.

Label printers and devices for creating tags with or without inscription are securely installed devices as also mobile hand-held devices.

Entrance and exit zones can be set up in a separate or in a common passage area with controlled accessibility. Every zone is either a one-way passage or a passage way that can be used in both directions for the entrance or exit of both goods and also customers, that means on the one hand the check-out area in which at least one reader detects all of the articles taken from the warehouse or sales room and on the other hand the entrance area through which the customers access the sales room or in which the delivery of articles is detected (check-in area), said area is also equipped with at least one reader. Entrance, and correspondingly, exit zones in lending or sales apparatus have automatic machines (4) for the staff-less settling of accounts for the entrance and exit of goods. These automatic machines can be equipped, for example, with card reading devices, SB-registers, displays and receipt printers.

The system's method flow shall be made clear in the following with an example of a flow plan for commerce and logistics:

- transport of goods not yet equipped with tags on palettes, belts, trays or in packaging for the detection of the incoming goods
- if necessary conditioning and weighing of the goods
- recall of the article number in the system, for example, by entering the article numbers by hand or by scanning in the EAN barcode
- issuance for each article a tag/label upon whose surface article information is included
- attaching the tag onto the goods
- scanning in goods that have tags on them with at least one tag reading device, if necessary, successive, done according to articles and sufficiently distant from those tags that are not yet in the system inventory, such that only the last articles that were labeled are scanned
- indication of the number of scanned in tags of the same article, comparison of the number of delivered packaged units with the VPE-report in the master file
- comparison of the order with the actual delivered goods (comparison of the order file with the incoming goods file)
- in the case of discrepancies, checking the master information and invoice/delivery file and, if necessary, filing a complaint
- transfer of the scanned goods into the inventory
- packaging into packages, onto palettes, or something else, and placing on the sales floor or into the warehouse

Administering automatic orders

- automatic report when receiving the communication of the inventory
- automatic summary of the articles to be ordered
- ordering according to manual or automatic contract confirmation, if necessary, in an electronic manner, storing the ordering data according to suppliers

Automatic selling in wholesale and retail stores:

- entrance through the check-in zone, selection of the goods
- enter into the check-out zone, close the cell, initiation of the computing process
- automatically scan in the tags by the reader, detection of the ID
- calculation of the total purchase
- customer selection of the mode of payment, payment of the charges per cash or with credit card
- print-out of receipt, securing of the goods exit
- opening of the exit, exit from the check-out zone

Patent Claims

1. System and method for monitoring and controlling automated, staff-less logistics systems, lending or sales systems, in particular staff-less supermarkets, department stores or libraries, said system records and detects marked articles with help from reading devices with electronic identification elements which allows the continuous 24-hour operation of a lending or sales apparatus, just as an automated article detection for incoming and outgoing articles and simultaneously makes the requirement of store staff superfluous.
2. System and method according to claim 1, where at least one additional reading device (1) detects the marked articles additionally in areas (2) where the articles are offered and/or stored, where through this both the inventory of the articles (5) stored there can be continuously monitored as also the loss of a marked article can be recorded and through this staff-less selling or lending of articles can be operated, especially staff-less self-service stores, libraries or an automated logistics system that monitors by itself the material flow and inventory of articles.
3. System and method according to the claims 1 and 2 are designed such that through the movement of marked articles (5) through the reading range of various, of at least two reading devices (1), the material or goods flow within a room (2/3) can be retraced, which allows the analysis of the movements, for example, for

- continuously conducted real-time customer studies.
4. System and method according to the claims 1 to 3 are designed such that a detection area (3) of the entrance and exit of articles (check-in/check-out zone) is at least one room, which allows both the passage of goods as also of people in both directions and represents an interface between the store (warehouse or sales room) and the outer areas, thus an entrance and exit of a store at the same time and in which especially articles according to the calculation at automatic machines (4) are paid with smart cards or with debit cards or with cash.
 5. System and method according to the claims 1 to 4 are designed such that controlling and monitoring the material flow are guaranteed by a continuous article identification in the logistics, beginning at the step of attaching identification elements to articles during or after they are fabricated, in distribution up to the sale to the end-users and in their household, for the monitoring of articles like groceries in an "intelligent house", in particular for the continuous monitoring of the inventory and inventory detection just as automatic detection of incoming and outgoing goods in the goods stores, where with this, information about the articles is sent into files and an automatic comparison of the articles to be delivered and those delivered is possible, just as automatic complaints for incorrect deliveries and automatic ordering of articles when a certain level of inventory is reached.
 6. System and method according to the claims 1 to 5, where reading devices (1) which identify articles (5) marked with tags are situated in rooms (2) where the articles are displayed or on shelves in stores, (tubular) lamps, palettes and transport media or on walls for the continuous detection of these articles, and are applied in check-in or check-out zones (entrance or exit of goods) in controlled access entrance and exit areas (3) for the automatic detection of articles.
 7. Identification element, also usable for a system and method according to the claims 1 to 6 is characterized in that an identification element (tag) consists of a carrier, for example, of a label and of a RFID-transponder, where the surface of the carrier of the label offers some room for various information, logos, advertising, barcodes or data of the marked article.
 8. Identification element, also usable for a system and method according to the claims 1 to 6 is characterized in that the material and the nature of the carrier allows the carrier to be used as antenna or resonant circuit of the transponder, such that the carrier itself or a component of the carrier fulfills this function.
 9. Identification element, also usable for a system or method according to the claims 1 to 6 is characterized in that the carrier can be attached in a bonded manner to every carrier article and the transponder itself can also adhere to the carrier article and the identification element experiences an irreparable change when the identification element is removed from the carrier article which will be recorded by the system and in the case that the signal strength between transponder and reading device is sufficient for their communication it allows the identification of the transponder by a reading device – also without antenna.

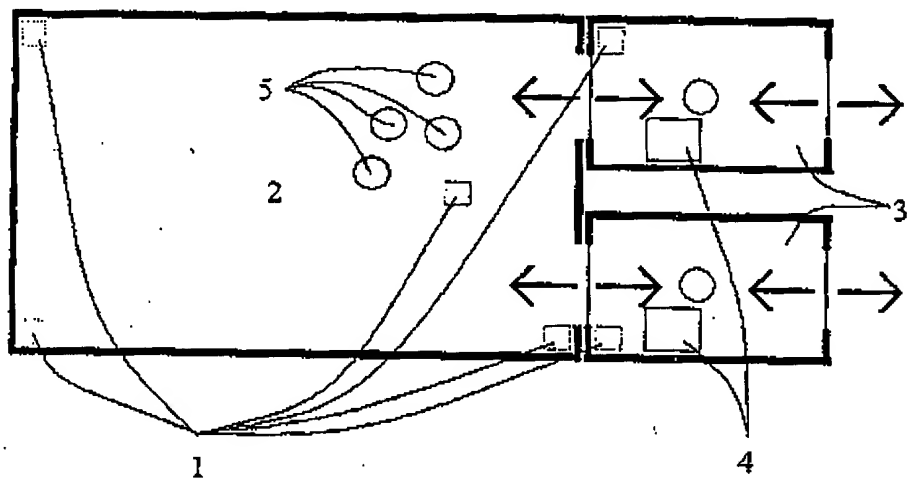


Fig. 1